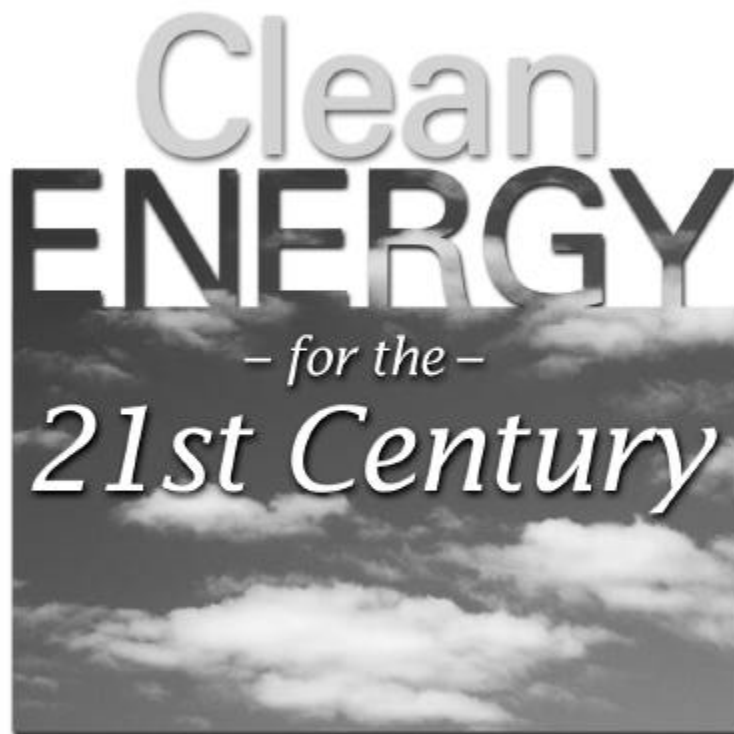


Budget-In-Brief

Fiscal Year 2001



Office of Energy Efficiency and Renewable Energy



U. S. Department of Energy

Office of Energy Efficiency and Renewable Energy Funding (in million of dollars)				
	FY 1999	FY 2000	FY 2001 Request	% Change (FY 00-01)
Industrial Technologies	162.8	175.2	184.0	5%
Transportation Technologies	239.9	271.7	305.3	12%
Building Technologies, State and Community Programs	261.1	284.0	339.8	20%
Power Technologies	271.7	255.0	334.6	31%
Federal Energy Management Program	23.8	24.0	34.5	44%
Management *	57.4	59.1	61.8	3%
Total EERE Program Level †	1016.7	1,068.8	1,260.0	18%

* Management includes Solar Program Direction, National Renewable Energy Laboratory maintenance, and Policy and Management

† Sums may not add due to rounding.

PODRA ‡	64.0		
Use of Prior Year Balances	2.4	.8	

‡ As a result of PODRA financing and prior year balances the actual budget authority in FY 1999 was \$950,313,000.



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FOREWORD



As we enter a new millennium, the Office of Energy Efficiency and Renewable Energy's (EERE) mission of advancing clean energy technologies will play an increasingly critical role, helping save money for energy consumers, making American's businesses more competitive, reducing the nation's reliance on imported oil, cutting pollution and greenhouse gas emissions, and improving public health. EERE leads the nation in the research, development, demonstration, and deployment of affordable, advanced energy efficiency and renewable energy and natural gas technologies and practices that will play a vital role in providing clean energy for the twenty-first century.

EERE meets the nation's energy challenges in two fundamental ways: by increasing the efficiency of devices, processes, and systems that consume energy and by increasing the supplies of clean energy resources. This allows Americans to use less energy overall and make greater use of the non-polluting energy sources we have here at home. In developing and deploying clean energy technologies, EERE helps build new U.S. industries and generate new export markets for U.S. energy products. These clean energy technologies – and their success globally – demonstrate that we *can* grow the economy while improving the environment.

For more than 20 years, EERE has played a leading role in developing and advancing clean energy technologies and stimulating supportive policies and markets throughout the U.S. and the world. The results of EERE programs are dramatic and will be celebrated worldwide on April 22 at Earth Day 2000 whose 30th Anniversary theme, appropriately, is "Clean Energy Now!"

EERE began Fiscal Year 2000 by putting our own house in order. We developed a strategic plan, implemented a strategic management system, and reorganized our offices to ensure the greatest efficiency. We can now build on past success while planning for the future. The promise of clean energy technologies is clear and an increased commitment by the public and private sectors is needed to realize the full benefits of our investment.

As we enter the next fiscal year, we will redouble our efforts with Congress, industry, state and local governments, tribal nations, and the public to move our nation closer toward our goal of Clean Energy for the 21st Century.

Dan W. Reicher
Assistant Secretary for
Energy Efficiency and Renewable Energy

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

Clean Energy for the 21st Century

The Office of Energy Efficiency and Renewable Energy (EERE) is meeting the challenges of the new century -- using less energy to power industries, vehicles, and buildings; and producing more power from clean energy sources such as renewable energy and natural gas. Energy technologies supported and promoted by the Office will play a key role in providing clean energy for the 21st century.

EERE achieves these goals through a strong and balanced program of research, development, demonstration and deployment (RDD&D) of advanced energy technologies, along with support for critical policies and markets. EERE is organized around five programs that focus their efforts on specific sectors of the energy economy—industry, transportation, buildings, power generation and delivery, and the Federal Government as an energy user. Our program activities are conducted in partnership with the private sector, state energy offices, universities, and other research organizations. EERE's reliance on partnerships stimulates private investments and gets more mileage out of Federal investments. These partnerships also help ensure that we develop technologies that private industry is interested in carrying forward to the marketplace.

Strategic Drivers

EERE's programs respond to five national drivers:

- National Security;
- Economic Competitiveness;
- Environmental Quality;
- Climate Change; and
- Electricity Restructuring.

National Security

Just 10 years ago, oil imports were less than half of what they are today. We now import fully 50 percent of the oil used in this country, placing even greater stress on the nation's security. And projections show imports increasing to 65 percent by 2020, with Persian Gulf nations accounting for over 64 percent of the world's oil exports. In 2020, U.S. net annual expenditures for imported crude oil and products are projected to exceed \$180 billion in current dollars. Advancing energy efficient technologies and increasing the use of domestic renewable energy sources will reduce costly energy imports and reduce our trade deficit.

Economic Competitiveness

A key to the United States' continued prosperity will be the availability of clean, reliable, and reasonably priced energy. The global economy is forecast to consume almost twice as much electricity in 2020 as it does today, providing challenges and opportunities for U.S. jobs and energy technology exports. EERE's research and development efforts, carried out in partnership with industry, national laboratories, and universities, are designed to maintain America's technological expertise and competitive advantage in the global market. A smart energy policy, as promoted by EERE's programs, strengthens the nation's

economic power.

EERE's investments lay the foundation for a more sustainable energy future *and* open markets for advanced U.S. technology. EERE sponsors international programs to promote U.S. energy efficiency goods and services and renewable electric and related power sector technologies in international markets. EERE also participates in the Department's Science Education programs to cultivate the next generation of science and technology leaders and ensure the nation's continued economic competitiveness.

Wind Powering America

Wind power has been used in the U.S. since the mid-1600's to pump water or grind grain. Today, the windmill's modern equivalent — a *wind turbine* — uses the wind's energy to generate electricity. Almost every region in the U.S. has areas suitable for wind energy development. Some states, particularly in the Great Plains region that stretches from Texas to North Dakota, have significant wind energy potential.

Wind power now represents a major economic opportunity for the United States. Substantially increasing the amount of wind generation could lead to as much as \$60 billion in capital investment in rural America over 20 years, generating \$1.2 billion in new income for American farmers, Native Americans, and rural landowners, displacing 35 million tons of carbon emissions into the atmosphere, and creating 80,000 permanent jobs in the wind industry.

In June 1999, Secretary Richardson announced the Wind Powering America Initiative, a regionally-based effort to facilitate the development of the market for clean wind energy in the U.S. over the next two decades. The Initiative challenges the Nation to meet 5 percent of our electricity needs by the year 2020 with wind power. Mid-term goals are to triple the number of states with significant wind power capacity and increase the Federal Government's use of wind generated electricity to 5 percent by 2010.

The Wind Powering America Initiative is working with regionally-based stakeholders to communicate the economic opportunities from wind technology development, provide technical and market support for pilot projects, and facilitate development and purchase of wind generated power on Federal facilities.

Environmental Quality

Air pollution, particularly in urban centers, ranks high among the nation's most pressing environmental concerns. In advancing a smart energy policy, EERE programs work to mitigate and minimize the environmental costs associated with energy use. By developing technologies that improve energy efficiency in industry and buildings, EERE's programs are concurrently identifying ways to reduce energy-related air pollutants that are by-products of conventional electricity generation methods. Furthermore, EERE's work on vehicle technologies will lead to greater fuel-efficiency as well as increased use of alternative fuels—both offering the potential for impressive reductions in emissions.

Climate Change

Scientific evidence continues to affirm the link between greenhouse gas emissions and climate change. The President's FY 2001 budget request for EERE programs is a major element of his strategy to reduce greenhouse gas emissions to below 1990 levels by 2008 - 2012 through energy technology research, development, deployment and supporting tax incentives. In 1997, a major study conducted by five DOE

national laboratories documented the critical role that early development and deployment of energy efficiency and clean energy technologies can play in reducing greenhouse gases. Given the cost savings associated with the use of these technologies, the study noted that aggressive investments in energy efficiency and clean energy technologies and deployment could lead to significant emission reductions without raising the nation's net energy bill. Furthermore, investments in clean energy technologies can provide viable alternative energy sources with fewer greenhouse gas emissions. Finally, these technologies can help to meet the expanding energy needs of developing countries.

Electricity Restructuring

The introduction of competition to the electric industry presents challenges and opportunities to clean energy technologies. DOE is working with utilities, industry, states, and consumers to ensure that the policies and market structures in the restructured electric industry take into consideration the benefits and reliability of clean energy technologies. Electricity restructuring presents an opportunity to reduce energy costs, advance the use of energy efficient and renewable energy technologies, and provide affordable services with reduced environmental impacts. "Green power" and "green pricing" programs are appearing across the country as the electricity sector transitions to a competitive market and advances continue in reducing the price and increasing the reliability of clean energy technologies.

Long-term Priorities

EERE has set aggressive but achievable goals for its key programs. These include, for example:

- Triple U.S. use of bio-based products and bioenergy by 2010 from the 1999 level, which could create as much as \$20 billion a year in new income for farmers and rural communities.
- Double the number of combined heat and power systems in the United States by 2010 from today's level to help mitigate transmission and distribution constraints by increasing U.S. on-site power generation capability.
- Triple the non-hydroelectric renewable energy generating capacity to 25,000 megawatts of installed capacity by 2010.
- By 2010, reduce energy consumption in federal facilities by 35 percent relative to the 1985 consumption level, saving taxpayers \$12 billion from 2000-2010.
- Increase the average fuel efficiency of new cars and light trucks by 20 percent in 2010 relative to the U.S. Environmental Protection Agency's reference fuel efficiency level.
- Reduce annual energy consumption for the buildings sector by 5 percent relative to the 2010 forecast level, thereby providing a cumulative residential and commercial building energy cost savings of as much as \$65 billion through 2010.
- Achieve \$3 billion in annual export sales of energy efficiency technologies by 2010, thereby creating about 100,000 jobs in the U.S. by 2010.
- Implement a system of program planning, budget execution and evaluation that enhances EERE productivity and communication through system efficiency gains.

Managing for Results

EERE understands that good corporate management practices are necessary to achieve program goals. With this in mind, a new organizational structure and new management team was put in place in 1999. The new structure, which emphasizes strategic management and planning, is resolving long-standing management issues and is committed to making further improvements. Specific reforms instituted in the past year and new initiatives are summarized below:

Implementing the New Strategic Management System: A key innovation in EERE has been the creation of the Strategic Management System (SMS). The system is an integrated method of performing the corporate processes of planning, budgeting, procurement, program execution, evaluation, and analysis. This systematic approach to management envisions a more active approach to the business of EERE.

In support of the SMS, EERE is pursuing a number of related and supportive strategies including: institutionalizing systematic program analysis and evaluation; integrating a baseline management system to track program execution; streamlining field management; leveraging technical capabilities and resources by increasing crosscutting programs; and consistently communicating with customers and stakeholders to increase understanding and acceptance of EERE technologies and policies.

Increasing Competition and Refining Merit Review Processes: In FY 1999, EERE substantially increased its competitive funding of grants and cooperative agreements. More than 90 percent of funds for new discretionary financial assistance awards were awarded on a competitive basis in FY 1999, versus 24 percent in FY 1996. EERE will continue to sharpen these competitive strategies in FY 2001.

During the past year, EERE issued two broad-based solicitations in order to increase competition for its discretionary financial assistance. One solicitation, with a total dollar value of approximately \$15 million in FY 1999 funding and approximately 140 agreements, involved information dissemination, outreach, training, and related technical analysis and technical assistance activities -- activities which often were awarded on a noncompetitive basis in the past. The second broad-based solicitation involved research, development, and demonstration of energy efficiency and renewable energy technologies. Following a rigorous merit review, EERE awarded approximately 40 grants and cooperative agreements under this solicitation, with a value of approximately \$7 million.

In 1999, EERE also refined its objective merit review processes through new regulations and additional guidance and training. These efforts will continue.

Leveraging Federal Investments by Expanding Partnerships with Federal, State and Other Entities: EERE is strengthening its partnerships with other government entities and the private sector to better leverage the Federal investment in RD&D and to facilitate the deployment of new technologies. For example, EERE has made substantial progress on increasing joint efforts with state organizations pursuing energy technology R&D. In 1999, the Department completed a landmark model agreement with the California Energy Commission to facilitate research activities between State research organizations and DOE's national laboratories. EERE also is strengthening the role of its Regional Offices in delivering services at the state and local level.

The FY 2001 Budget Request

The following table shows EERE's prior year program funding levels and the fiscal year 2001 budget request.

Office of Energy Efficiency and Renewable Energy Funding (in million of dollars)				
	FY 1999	FY 2000	FY 2001 Request	% Change (FY 00-01)
Industrial Technologies	162.8	175.2	184.0	5%
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The following sections of this Budget in Brief summarize how the Office of Energy Efficiency and Renewable Energy will pursue critical work in energy efficiency and renewable energy in fiscal year 2000.

OFFICE OF INDUSTRIAL TECHNOLOGIES

Increase Productivity with Cleaner Industrial Processes for the 21st Century

Efficient use of energy by industry is critical to the nation's productivity. Three-fourths of the energy consumed by the U.S. industrial sector goes to the pulp and paper, primary metals, chemical, petroleum, glass, mining, and agricultural industries. Virtually every manufacturing process uses more energy than is necessary. In addition, these industries generate about three fourths of industrial waste and pollution. Advanced technologies improve industrial productivity by lowering energy costs, providing innovative manufacturing methods, and reducing waste and emissions.

The EERE Office of Industrial Technologies (OIT) works with energy-intensive industries to improve energy efficiency, environmental performance and productivity. OIT's goal for 2010 is to reduce industrial energy use per unit of output by 25 percent. In partnership with industry groups, we are developing new technologies for heat recovery, energy utilization, and industrial waste management and making process improvements for manufacturing pulp and paper, steel, and chemicals. Applied research in combustion, biotechnology, advanced materials, and heat transfer is providing the foundation for future advances.

Ongoing Programs

Industries of the Future (Specific) – Our Industries of the Future program aligns its resources with our principal customers -- the energy- and waste-intensive industries that have developed an industry-wide consensus on improving energy and environmental performance. Industries of the Future partnerships provide the catalyst for tapping into America's vast capabilities in R&D for the development and deployment of advanced energy and material-efficient technologies.

The Industry of the Future process begins with the development of an industry-wide vision statement. This vision projects the changes needed over a 20-25 year period for the industry to remain competitive through improved energy efficiency and environmental performance. Industry of the Future partners then prepare a technology roadmap that defines the technologies to be pursued in cooperative research and development aimed at realizing the vision. Industries of the Future include:

- **Forest Products:** OIT is developing energy efficient technologies to reduce emissions and reuse effluents in the forest products industry and reduce energy use. Technologies identified in the roadmap "Agenda 2020" will be researched to meet 2020 goals such as reducing water effluent levels by 35 percent from 1991 levels, reducing purchased electricity use to zero, and by 2020 to increasing recovered paper utilization to over 50 percent.
- **Steel:** OIT is conducting research that will improve performance of the major energy using components in the ironmaking and steelmaking processes. Improved design, new sensing and control systems, more efficient burners, increased use of net shape casting processes, better use of byproducts to reduce use of virgin materials, and changes in operational practices resulting from this research will increase efficiency, reduce emissions (especially NO_x and carbon dioxide), and lower costs. By 2010, goals are to reduce overall energy use by almost 20 percent per ton of steel produced .
- **Aluminum:** An accelerated research program will be initiated for the development and implementation of an advanced technology with the potential to reduce energy consumption by 27

percent from current best practices, and greenhouse gas emissions by 58 percent from a 2000 baseline. Development of improved anode and cathode materials for inert anode technology is the focus of the program. Implementation of an advanced cell of this kind would be the most significant advancement in aluminum production technology since the development of the Hall-Heroult process in 1886. Saltcake recycling will be demonstrated at pilot-plant scale and R&D will be conducted to develop improved sensors and controls for aluminum smelting.

- **Metal Casting:** OIT is working with more than 21 universities and research organizations performing research through the Metal Casting Industry of the Future Research Program to achieve a 10 percent combined yield increase and scrap reduction by 2020 resulting in a 10 percent energy savings by 2020. The program is developing advanced techniques, new tools and sensors to improve the energy efficiency of casting processes. Research in these areas includes the development of advanced lost foam technology and binders, semi-solid metals processing for models, material property characterization and high volume low weight castings. This research is directed to improve metal cleanliness, reduce casting defects, increase energy efficiency, increase productivity and increase U.S. competitiveness of the metal casting industry.
- **Glass:** To meet future challenges of the glass industry (which includes flat glass, container glass, fiberglass and specialty glass) OIT 2020 goals are to reduce energy use by about 25 percent, production costs and air and water emissions by at least 20 percent as well as recycling and recovering of 100 percent of in-process production wastes and available post-consumer glass. Research is targeted to furnace refractory materials, use of microwaves and ultrasonic waves for controlling glass shape and other critical process variables, high-temperature sensors for control of production processes. Research is directed toward increasing energy efficiency of production, environmental protection, recycling and development of innovative uses for glass.
- **Chemicals:** OIT is working to achieve by 2020 a 30 percent reduction per pound of chemicals produced in energy consumption, materials used, water consumption, and pollutant and toxic dispersion. Research will be targeted to critical areas identified in industry roadmaps in areas including separations, materials technology and materials of construction, catalysis, and alternative synthetic pathways in the chemical industry. Industry-lab consortium projects will be continued in computational fluid dynamics, demonstration of new fabric-like electrode for chlor-alkali production to reduce electricity consumption and the associated carbon dioxide emissions, development of a new production pathway for succinic acid from an inexpensive wood-based material, and a new membrane process to recover ethylene and propylene more efficiently.
- **Petroleum:** OIT is working by 2020 to improve manufacturing efficiency by 10 percent and reduce combustion and fugitive emissions by 50 percent. Research will be targeted toward critical industry needs identified in the petroleum vision and roadmap now in preparation. Examples of possible projects include biocatalytic desulfurization of gasoline, and an advanced fluid cracking model.
- **Mining:** Research is directed toward a goal of saving 10 percent of the energy used to crush a short ton of rock. The mining initiative is focused on safe and efficient technologies to benefit the breadth of the industry. Research will include new technologies for underground imaging, minerals separations, and process modeling to increase productivity, save energy and reduce environmental disturbances.
- **Agriculture:** OIT will target research and development which can achieve a five-fold increase in the percentage of basic chemical building blocks derived from plant/crop based renewables by 2020.

Projects will focus on some of the top priorities identified in its industry partners' roadmap for renewable bioproducts, specifically targeting the areas of processing and utilization of homegrown crops, trees, and agricultural wastes as biomass resources for the production of potentially a huge range of consumer goods, such as paints, plastics and adhesives. A broad-based coalition from the American agricultural, forestry and chemical communities supports the goal of winning 10 percent of the market share of industrial feedstocks by 2020. The "Renewables Vision 2020" effort will be integrated with other programs in government, industry and academia for increased use of biomass for electricity generation, transportation fuels, and industrial and chemical products under the President's new Bioenergy initiative.

- **Supporting Industries:** OIT will issue competitive solicitations to industries which are critical to making significant energy and cost savings in Industries of the Future. Examples of supporting industries are forging and heat treating which directly support steel and aluminum industries.

Industries of the Future (Crosscutting) – The Industries of the Future-Crosscutting program encompasses research and development aimed at crosscutting technologies that are applicable to all energy-intensive industries and provides integrated technical and financial assistance to advance the deployment of highly efficient and productive technologies. The objective is to work with Industries of the Future partners and suppliers to conduct cost-shared R&D to develop crosscutting and enabling technologies which have applications across all of the vision industries, and to provide the tools and technical assistance industry needs to speed the implementation of energy efficient, clean manufacturing technologies.

- **Enabling Materials, Engineered Ceramics/CFCCs:** The program addresses the critical technology challenges partners face for developing: 1) new, advanced ceramic composites which are resistant to heat, corrosion, erosion and chemical activity but are also tough and resistant to thermal shocks. 2) advanced industrial materials such as intermetallic alloys, and membranes for separation processes which can reduce energy use, lower emissions, increase component life, optimize process operating conditions, and reduce down time; 3) high-efficiency, clean combustion technology that can produce uniform, high-quality end products at high production rates reducing fuel consumption by 20% and criteria pollution emissions by up to 90 percent by 2020; and 4) sensors/control systems that can operate in high temperatures and harsh environments while increasing process efficiency and are critical to introducing many new processes in industry. As part of the President's Bioenergy Initiative in cooperation with industry and other EERE offices, OIT will develop biomass and black liquor gasification technologies which have a significant positive impact on climate change while improving the energy efficiency of pulping processes.
- **Distributed Generation:** The program seeks to develop 1) new high-efficiency and very low emissions industrial power/cogeneration systems, including industrial-scale turbines, microturbines, and reciprocating engines; and 2) industrial distributed generation systems, including combined heat and power technology. By 2020, microturbines can reach 40 percent efficiency and reciprocating engines can reach 50 percent efficiency with consequent emissions reductions providing significantly energy savings and emissions reductions for a range of industrial power applications. The Advanced Turbine System program will be completed.
- **Financial Assistance:** The goal of OIT's integrated delivery of financial assistance services which includes the Inventions and Innovation Program and the NICE3 Program, is to 1) provide critical financial assistance to speed the development of new energy efficient technologies; and 2) leverage industry and other resources to demonstrate and promote the adoption of clean, energy-efficient

industrial technology. Grants are focused on technologies which can make significant energy savings, productivity improvements and emissions reductions in Industries of the Future.

Best Practices

By simply switching off one of four fans in each system in its pot-line fume collection system and regulating the flow from the remaining three fans in one of its plants, Alcoa increased fan efficiency to 84 percent and reduced energy consumption 12 percent, saving \$103,736 per year. This kind of opportunity is why OIT has extended its Industries of the Future strategy to bring together the best available tools, technologies, processes and practices to help industry begin reducing energy use, saving money, and improving productivity right away! The new approach, Best Practices, offers a complete portfolio of technical assistance and information resources designed to deliver immediate payback. Through the Best Practices approach, industry has easy access to the tools needed to identify plant-wide cost-cutting opportunities, prioritize energy efficiency investments, select the best equipment and understand near- and long-term technology solutions. This activity integrates the resources of the "Challenge" programs - Motor, Steam, Compressed Air, Combined Heat and Power and the Industrial Assessment Centers - into the OIT Best Practices portfolio.

- **Technical Assistance:** Individual areas of technical assistance including motors, steam, compressed air, process heaters, combined heat and power, and other tools and services are merged into Best Practices which facilitates working with plant level managers to provide better customer service and greater value. Industrial Assessment Centers will continue to work with small and medium sized businesses to provide energy and waste audits as well as providing support to IOF showcases of clean energy. Internationally, Best Practices support will be initiated in at least three key developing countries to provide ways to significantly reduce carbon emissions as well as provide new markets for advanced industrial technologies.

FY 2001 Highlights

Industries of the Future - Specific – IOF's public-private partnership efforts focus on developing promising new process-related technologies with industry and other organizations to address needs identified in industry-wide developed visions and roadmaps. Cost shared projects that cut energy use, emissions, and waste in multiple industries and provide cost-effective solutions to reduce greenhouse gas emissions are supported. FY 2001 efforts concentrate on new bioenergy initiatives with the forest products and agriculture industries and support for supporting industries, for example forging and heat treating. In addition, increased support for the mining and petroleum industries has been provided for improved mineral processing technologies and downstream petroleum needs identified by the industry roadmap.

Industries of the Future - Crosscut – These programs develop technologies that are useful to multiple industries simultaneously. The program delivers information and tools to help plant managers make informed decisions on technology choices today that result in energy, waste and dollar savings. The program supports research to develop power generation equipment, combustion equipment, and sensors and controls. OIT also develops advanced materials which address a multitude of wear and corrosion problems. In addition, the crosscut area supports new ideas from inventors, and funds grants for demonstration of technologies that will be viable in the near term. FY 2001 efforts focus on the development of gasification technology under the combustion area as well as an expansion in micro-turbines. Reciprocating engine technologies will be fully launched while support for low emission technologies, controls, and hot section

components for industrial scale advanced turbines will continue. Individual areas of technical support are rolled up into Best Practices. This allows the services and tools developed for industry to have a common look and to work together, providing more options and greater value to the plant manager in making energy efficiency decisions.

Industrial Technologies Program Funding (in million of dollars)				
	FY 1999	FY 2000	FY 2001 Request	% Change (FY 00-01)
Industries of the Future (Specific) *	56.4	66.0	83.9	27%
Forest and Paper Vision	11.8	12.1	17.1	41%
Steel Vision	10.3	10.6	10.9	3%
Aluminum Vision	7.9	11.2	11.0	-2%
Metal Casting Vision	5.7	5.8	5.8	0%
Glass Vision	4.7	4.8	4.8	0%
Chemicals Vision	12.1	12.5	12.5	0%
Petroleum Vision	0.0	2.0	3.0	50%
Mining Vision	2.0	3.0	4.0	33%
Agricultural Vision	2.0	4.0	13.0	225%
Supporting Industries Vision	0.0	0.0	1.8	
Industries of the Future (Crosscutting) *	98.1	94.4	90.8	-4%
Enabling Technologies	18.9	36.0	35.7	-1%
Distributed Generation	50.1	27.3	17.3	-37% †
Financial Assistance	10.5	11.4	12.0	5%
Technical Assistance	18.6	19.8	25.8	30%
Management and Planning	8.2	8.9	9.3	4%
Cooperative Program with States	0.0	2.0 ‡	0.0	
Energy Efficiency Science Initiative	0.0	3.9 ‡	0.0	
Total *	162.8	175.2	184.0	5%

* Sums may not add due to rounding.

† Reduction due to completion of the Advanced Turbine Systems (ATS) program.

‡ Funding provided by Congress in FY 2000.

OFFICE OF TRANSPORTATION TECHNOLOGIES

Transportation Efficiency for the 21st Century

Transportation accounts for 67 percent of the petroleum consumed in the United States, and the transportation sector remains 97 percent dependent on petroleum. The explosive popularity of low fuel economy pickup trucks, vans, and sport utility vehicles used for personal transport -- coupled with a growing economy, low fuel prices, and increasing travel -- are pushing transportation fuel consumption higher. These levels of consumption increase air pollution and the emission of greenhouse gases. Given continued growth in transportation, the only feasible alternatives for reducing climate change emissions and improving our energy security are vehicles with high fuel economy and the widespread use of clean non-petroleum fuels.

The EERE Office of Transportation Technologies (OTT) supports high-risk research and development to advance highly efficient transportation technologies and clean alternative fuels. OTT's programs reduce energy demand (particularly for petroleum), pollution, greenhouse gas emissions, and the nation's vulnerability to energy supply disruptions. Current market pricing of fuels and vehicles, current consumer preferences and the riskiness of advanced vehicle and fuels R&D together provide little incentive for the private sector to invest on its own in this critical research and development. The development and market acceptance of advanced vehicle technologies (advanced direct-injection engines, hybrid-electric drive systems, fuel cells, and lightweight materials) and alternative fuels (ethanol from biomass, natural gas, electricity and others) have the potential to reduce oil consumption by .7 million barrels per day in 2010 and 2 million barrels per day in 2020. Greenhouse gas emissions would decline by 20 million metric tons in 2010 and 60 million metric tons in 2020.

Ongoing Programs

Vehicle Technologies R&D – The Vehicle Technologies R&D Program supports development and validation of technologies that will produce substantial improvements in fuel economy for automobiles and trucks, without sacrificing environmental performance or affordability. This work is conducted in cooperation with industry, universities, the National Laboratories, and the other Federal Agencies. Much of it is done in the context of the Partnership for a New Generation of Vehicles (PNGV). Major goals are the development of pre-production prototype automobiles with up to three times the fuel economy of today's conventional automobile, by 2004; advanced low-emission diesel cycle engines for pickup trucks, vans, and sport utility vehicles, which achieve at least a 35 percent fuel efficiency improvement relative to current gasoline-fueled trucks, by 2004; and engine and vehicle technologies for Class 7 and 8 trucks which will increase the fuel economy to 10 miles per gallon (mpg) from the current average of 7 mpg, by 2004. The following areas are addressed in this program.

The Automotive and Heavy Vehicle Hybrid Systems R&D program develops and validates production feasible, cost competitive hybrid vehicle propulsion components and systems. Key technologies include more efficient ancillary subsystems, high-power energy storage, advanced power electronics and electric motors, as well as heavy vehicle propulsion systems for urban service trucks and transit buses.

The Fuel Cell R&D program addresses critical technology barriers to developing fuel-flexible fuel cell systems for automotive applications. Fuel cells have been selected by the PNGV as a priority technology; they are critical to achieving the goal of an 80 mpg vehicle with extremely low emissions. The program emphasizes high fuel efficiency, long life, very low emissions, and low manufacturing cost. These

characteristics can be achieved through component development, subsystem development, technology integration, in conjunction with validation of fuel cell stack systems, fuel-flexible fuel processors, and onboard hydrogen storage.

PNGV Highlights from the Detroit Auto Show

The major milestone of the Partnership for a New Generation of Vehicles (PNGV), scheduled for the year 2000, is the announcement from automakers of concept cars that demonstrate the feasibility of combining promising technologies developed through joint government-industry R&D. Ford and General Motors chose to unveil their PNGV concept vehicles during Press Week, January 10-14, 2000, at the North American International Auto Show in Detroit.

Arriving on stage in the hybrid Prodigy, Ford Motor Company Chairman William Clay Ford Jr., acknowledged the DOE role in PNGV R&D that made the Prodigy possible. Offering refinements in powertrain, aerodynamics and rolling resistance over the P2000 LSR delivered to the DOE last October, the Prodigy was described as “an interim stage” between the P2000 research programs and Ford’s plans for “an affordable, production hybrid in 2003.”

General Motors Vice Chairman Harry Pearce unveiled the Precept, a fully functional hybrid electric five-passenger family sedan that achieves the equivalent of 80 miles per gallon of gasoline. At that point, another Precept was driven onto the stage: this one a fuel cell version. Pearce expressed confidence that the fuel cell powered Precept will demonstrate the equivalent of 108 miles per gallon, or four times the fuel economy of the PNGV baseline vehicles. He concluded, “It was the Department of Energy that took fuel cells from the aerospace industry to the automotive industry, and they should receive a lot of credit for bringing it to us.”

The Advanced Combustion Engine R&D effort aims to significantly improve the fuel efficiency of piston engines while meeting projected emission regulations. Compression ignition direct injection (CIDI) engines have the highest thermal efficiency of any proven powerplant and are excellent candidates for hybrid, as well as conventional, drive systems for autos and trucks. The CIDI emission control R&D focuses on development of exhaust aftertreatment devices, including advanced catalysts needed to meet EPA Tier II NO_x and particulate standards. The program also supports fuel efficiency and emissions reduction R&D for spark ignition direct injection (SIDI) gasoline engines.

The Cooperative Automotive Research for Advanced Technology (CARAT) and Graduate Automotive Technology Education (GATE) programs are designed to apply the expertise of the nation’s small businesses and universities to research on the most critical vehicle technology challenges. Bench-scale hardware projects showing the greatest potential for achieving performance, manufacturability, and cost objectives will progress to near-vehicle scale prototype development, and later to pre-production through partnerships with small businesses, universities and suppliers. GATE has established centers of research in five crosscutting automotive technology areas at nine universities for the establishment of a graduate curriculum, research programs, and a limited number of fellowships. The program to Stimulate Innovative Truck Concepts and Knowledge (STICK) addresses a host of ideas propounded by individuals, small companies and universities to make trucks more fuel efficient, cleaner and safer.

Under Electric Vehicles R&D, and in partnership with the U.S. Advanced Battery Consortium (USABC), the Transportation Sector program supports battery research to improve the range, performance and cost of

new electric vehicles. OTT will conduct R&D and extensive in-vehicle testing of lithium polymer batteries, which could offer three to four times the range and significantly greater performance and life, compared to conventional lead acid batteries.

Heavy Vehicle Systems R&D addresses aerodynamic drag and rolling resistance in heavy trucks, among other causes of fuel use inefficiency. Improved gears, transmissions, tires, and materials could reduce rolling resistance, which is responsible for 28 percent of such “parasitic” losses. Enhancing truck safety through R&D, especially focusing on braking systems and pressure vessel integrity for alternative fuel trucks, is of growing importance due to the increasing number of heavy commercial trucks on the road.

Fuels Utilization R&D – The Fuels Utilization R&D Program identifies, develops, and tests new fuel formulations for advanced automotive and truck engines being developed in the Vehicle Technologies R&D Program. New fuel formulations, in combination with advanced powerplants and new exhaust after treatment technologies, are vital to simultaneously achieve high fuel economy and lower emissions. In partnership with energy companies, engine/vehicle manufacturers, and emission controls manufacturers, the Advanced Petroleum-Based Fuels activity evaluates fuels, determines their effects on emission control technologies, and identifies approaches to meeting more stringent emission targets in the context of technologies to achieve higher fuel efficiencies. In the near-term, Alternative Fuels collaborations with the natural gas industry, heavy duty engine/vehicle manufacturers, and natural gas storage tank manufacturers are developing technologies that enable the cost-effective use of natural gas in medium and heavy duty trucks. For the long term, fuels derived from natural gas, such as dimethyl ether and Fisher Tropsch diesel, will be evaluated.

Materials Technologies – OTT supports research and development of materials enabling lighter, more fuel-efficient automobiles and trucks with low emissions, enhanced safety and performance characteristics, and improved cost competitiveness. The program focuses mainly on aluminum, polymeric matrix composites, and other materials which have the potential to substantially reduce weight in structural applications. It also encompasses investigation and development of “propulsion system” materials to improve the efficiency of fuel cell systems, reduce emissions from CIDI engines, and reduce the size and weight of power electronics.

Technology Deployment – The Technology Deployment program uses testing, evaluation, public information, and regulatory and voluntary programs to facilitate the acquisition of alternative fuel and advanced technology vehicles by government and private fleets, leading to accelerated penetration of advanced vehicles and fuels in the broader market. The Deployment program targets its efforts on niche markets where alternative fuel and advanced vehicles can be most competitive, leveraging significant investments from State governments and industry stakeholders. The flagship Clean Cities program encourages local governments and organizations to form public/private partnerships for developing alternative fuel vehicle markets. Currently, over 75 Clean Cities are saving at least 11 million gallons of oil each year with a combined fleet of more than 165,000 alternative fueled vehicles. Several programs cross regional and state boundaries, expanding purchasing power and establishing corridors with refueling infrastructures.

OTT also sponsors the Future Car and Truck Challenges and the Ethanol Vehicle Challenge. Each year these advanced vehicle competitions offer hundreds of college students an unparalleled experience in automotive engineering and demonstrate the technologies supported by OTT in on-road vehicles.

Biofuels Energy Systems – The Biofuels Energy Systems Program supports research, development and demonstration of technologies to produce and convert cellulosic biomass materials to liquid transportation

fuels, focusing on the production of ethanol. Biomass includes forestry residues, agricultural waste and energy crops grown specifically for production of fuels and other energy coproducts. Biofuels provide a means of diversifying the fuel base with a domestic renewable fuel, and are viewed as the most feasible supply side transportation option to significantly reduce carbon emissions by the year 2020. The Biofuels program is a key component of the President's new Bioenergy Initiative.

FY 2001 Highlights

Vehicle Technologies – In FY 2001, the PNGV concept vehicles, which were completed in FY 2000, will be further developed to improve performance and reduce cost. These vehicles can achieve up to three times the average fuel economy of the 1993 Taurus, Lumina, and Concorde models, and are the products of cooperative R&D between DOE and industry in hybrid-electric drive systems, automotive integrated power modules, fuel cells, lightweight materials, advanced direct-injection engines, and advanced electric motors.

Vehicle Technologies R&D activities in FY 2001 will focus on reducing production costs, enhancing performance, and reducing vehicular emissions. Specifically, improved computer tools will be used to shorten the design time and reduce the costs of hybrid vehicle development. Performance and life cycle testing of 50-volt lithium-ion battery modules will proceed. Having concluded Phase II of the DOE/USABC Cooperative Agreement for long-term R&D of advanced batteries for electric vehicles, Phase III will be fully underway, focusing on long-term, lithium-based advanced batteries. An automotive-size fuel cell stack system and fuel-flexible fuel processor, integrated with their required accessories, will be validated. More compact and less expensive power electronic modules will be designed and tested. Advanced electric motors that are smaller, more efficient, and less costly will be designed and tested. Intermediate targets for particulates and NO_x for diesel engine emission control devices will be achieved. For urban duty heavy vehicles, an 80 percent improvement in fuel efficiency, a 95 percent reduction in particulate emissions, and a 30 percent reduction in oxides of nitrogen emissions will be demonstrated. In addition, the program will continue development of clean diesel engine technologies and aftertreatment systems to achieve light trucks that are 35 percent more fuel efficient and meet EPA emissions standards.

Fuels Utilization – During FY 2001, the Fuels Utilization R&D Program will conduct research in conjunction with the Coordinating Research Council to determine the environmental impact of increasing the numbers of diesel trucks and alternative fuel heavy vehicles. The initial screening of fuels for fuel cell systems will be completed, and advanced liquid fuels for PNGV concept vehicles and trucks will be selected. Fuels such as dimethyl ether and natural gas will be evaluated for use in direct injection engines for PNGV vehicles and light trucks.

Materials Technologies – The Materials Technologies Program, which encompasses R&D for both automotive and heavy vehicle applications, will demonstrate the feasibility of carbon fiber production at cost competitive levels for automotive applications. The feasibility of casting large aluminum and high strength steel truck body components will be established. Ceramic material for regenerative exhaust filters, which will enable diesel engine particulate emissions of less than 0.025g/mile, will be demonstrated. For power electronics, the program will fabricate and test high temperature, low loss capacitors with a ten times volume reduction.

Technology Deployment – In FY 2001, the Technology Deployment Program will use Clean Cities to focus alternative fuel efforts in proven niche markets while expanding strategic infrastructure partnerships and providing objective information to fleets and the general public. Demonstration and evaluation of near-commercial advanced vehicles will be encouraged through partnerships with industry and grants to states and Clean Cities. The unique university/industry partnerships of the student competitions, Future Truck

2000 and Ethanol Vehicle Challenge, will be used to push the envelope of technology and develop a new generation of transportation engineers.

Biofuels Energy Systems – The Biofuels Program will demonstrate the world’s first small commercial-scale conversion of agricultural crop wastes to ethanol. For this program, a partnership will be established to demonstrate ethanol production from cellulosic biomass (corn fiber and corn stalks) to increase yield from an industrial corn to ethanol facility. The President’s new Bioenergy Initiative will integrate all the EERE sectors’ work on biomass. A competitive solicitation will be issued for bioenergy and biobased products research and development, based on the President’s Bioenergy Initiative vision and technology roadmaps.

Transportation Technologies Program Funding (in million of dollars)				
	FY 1999	FY 2000	FY 2001 Request	% Change (FY 00-01)
Vehicle Technologies R&D	123.7	141.4	161.2	14%
Fuels Utilization R&D	17.5	21.6	24.5	13%
Materials Technologies	36.8	42.5	38.5	-9%
Technology Deployment	12.7	12.8	17.0	32%
Biofuels Energy Systems	41.2	38.9	54.4	40%
Management and Planning	7.9	8.5	9.7	13%
Cooperative Programs with States	0.0	2.0	0.0	0%
Energy Efficiency Science Initiative	0.0	3.9	0.0	0%
Total *	239.9	271.7	305.3	12%

* Sums may not add due to rounding.

OFFICE OF BUILDING TECHNOLOGY, STATE AND COMMUNITY PROGRAMS

Advanced Technologies for Home and Office in the 21st Century

In 1997, Americans spent approximately \$238 billion to heat, cool, light, and run the equipment and appliances in the nation's buildings. Buildings account for well over a third of U.S. energy consumption. Energy use in buildings is responsible for 35 percent of the nation's carbon dioxide emissions, 47 percent of sulfur dioxide emissions and 23 percent of nitrogen oxide emissions. These emissions are expected to increase by more than 25 percent between now and 2010.

In partnership with industry and government, EERE's Office of Building Technology, State and Community Programs (BTS) develops, promotes, and integrates energy technologies and practices to make buildings more efficient and affordable and communities more liveable. Accomplishing this mission through a variety of innovative programs that leverage non-Federal resources and expertise will save tens of billions of dollars, create new jobs, and lower the emission of air pollutants, including greenhouse gases.

The current BTS Strategic Plan initiated an organizational change that is revolutionizing the way BTS serves and works with its stakeholders and customers. To implement its Strategic Plan, BTS conducted extensive peer review to ensure that our science is sound, restructured our organization to be more customer-focused and results-oriented, and is completing initial, and moving forward on additional technology road maps to better guide future research, development and deployment (RD&D). The road maps are helping shape research and development competitive solicitations for industry-led projects. BTS continues to focus its efforts on three strategies to improve building energy efficiency:

- Accelerate the introduction of highly efficient buildings technologies and practices through research and development;
- Increase the minimum efficiency of buildings and equipment through building codes, appliance standards, and guidelines; and
- Encourage the use of energy-efficient and renewable energy technologies and practices through technology transfer and financial assistance.

To more effectively implement these strategies, the FY 2001 budget request for BTS programs has two major elements. The Office of Building Research and Standards will advance long-term scientific development by implementing the first two strategies, while the Office of Building Technology Assistance will increase the deployment of new technologies and practices by implementing the third strategy.

Ongoing Programs

BTS' new approach places greater emphasis on industry-driven collaborative RD&D and on working with industry and community partners to transfer research results to the residential and commercial sectors. BTS is committed to expanding partnerships and cost sharing, improving peer review, and enhancing the program review process to better measure the quality and effectiveness of ongoing programs.

BTS will continue to work with the Office of Power Technologies (OPT), the Office of Industrial Technologies (OIT), and the Federal Energy Management Program (FEMP) to integrate energy efficiency and solar technologies into new and existing buildings, including those at Federal facilities. BTS will also

work cooperatively with other agencies to incorporate energy efficiency in ongoing activities such as the Partnership for Advancing Technology in Housing (PATH).

Building Research and Standards – The Building Research and Standards program reflects the ongoing transition of the BTS building agenda toward a more focused “whole buildings” approach that addresses the dynamic nature of buildings and user requirements as interrelated systems. Research is conducted on individual building components and their interaction in thermal, ventilation, and lighting systems, as well as within the building as a whole. BTS uses the results of this research to develop energy-saving approaches that improve the integration of systems so that overall building performance is enhanced cost-effectively throughout a building’s life.

BTS conducts most of its energy research and development through cost-shared partnerships with industry, national laboratories, universities, and States. The Building Research and Standards program is organized in four sections.

The Technology Road Maps and Competitive R&D program develops technology road maps to identify opportunities, set priorities, review goals, and help expand partnerships. The road-mapping process helps private and public sector partners reach a consensus on future R&D direction and improve collaboration. Partners for new R&D activity will be sought through competitive solicitations.

The Residential Buildings Integration program works with industry to jointly fund, develop, demonstrate, and deploy housing that integrates energy-efficient technologies and practices. BTS implements R&D on residential buildings through its *Building America* partnership with industry. Residential Buildings Integration also includes regulatory activities, such as supporting improvements to the next generation of residential building model energy codes and promulgating updated Federal residential building energy codes. These efforts help transfer energy-efficient building techniques and practices into residential buildings.

The Commercial Buildings Integration program works to realize energy-saving opportunities provided by the whole buildings approach during the construction and major renovation of existing commercial buildings. BTS is increasing its industry partnerships in design, construction, operation and maintenance, indoor environment, and control and diagnostics of heating, ventilation, air conditioning, lighting, and other building systems. We help transfer the most energy-efficient building techniques and practices into commercial buildings through regulatory activities, such as supporting the upgrade of voluntary (model) building energy codes and promulgating upgraded Federal commercial building energy codes.

The Equipment, Materials, and Tools program conducts R&D on building components and design tools and issues standards and test procedures for a variety of appliances and equipment. The program conducts R&D on components such as innovative lighting, advanced space conditioning and refrigeration, and fuel cells that increase the energy efficiency of buildings and improve building performance. The program also conducts R&D on building envelope technologies, such as advanced windows, coatings, and insulation. We are improving analytical tools that effectively integrate all elements affecting building energy use and assist building designers, owners, and operators to develop the best design strategies for new and existing buildings.

BTS is accelerating the lighting and appliance energy efficiency standards program to realize even greater savings of energy, consumer energy cost, and air emissions. This acceleration will build upon recent progress in improving the standards-setting process. Improved analytics will enable early determination of consensus standards in some cases and accelerate the pace of the process in others. BTS is also

accelerating the adoption and widespread use of advanced commercial and industrial equipment by developing unbiased test procedures that accurately assess equipment performance and help ensure product quality in the marketplace.

Building Technology Assistance – BTS works with private and public sector stakeholders to speed the marketplace adoption of energy efficiency technologies. This is accomplished by establishing State, community and public-private partnerships and by providing financial and technical assistance to partners. BTS works with communities to leverage local resources, tailoring programs to meet local circumstances and needs. This approach provides improved customer service and satisfaction, and helps speed the widespread adoption of energy-efficient technologies developed as a result of BTS-sponsored research. BTS further accelerates the introduction of the most energy-efficient building techniques and practices by providing training and assistance to States in adopting and implementing new building codes. The Building Technology Assistance, which includes the former State and Community programs, reflects BTS' emphasis on accelerating the adoption of energy-efficient technologies and is organized in four sections.

The State Energy Program provides grants that enable States to tailor energy efficiency programs to local needs and leverage non-Federal resources. The Special Projects component of the State Energy Program helps deploy EERE technologies using funding from specific EERE programs.

The Weatherization Assistance Program extends the benefits of energy efficiency technologies and practices to families who can least afford them, with priority given to households with elderly members, persons with disabilities, and children. By the end of FY 1999, 4.7 million homes of low-income families had been weatherized.

Competitive R&D — A Smarter Way to Building Energy Efficiency

As part of its new way of doing business, BTS has awarded \$8.3 million in grants to fund promising building efficiency R&D projects. The 19 grant recipients are contributing an additional \$3.3 million in industry cost share. These competitive grants help implement BTS' road-mapping activities and support development of innovative technologies. One new, small-business partner proposes to develop an energy-efficient and durable solid-state ceramic lamp, a flat panel light source which can save energy in a wide variety of applications. Another partner proposes to develop a new dehumidification system that uses electrically-charged polymeric desiccant gels. Another small business partner proposes to develop a system that places heating and cooling air ducts inside a wall-to-ceiling cornice, saving energy while maintaining aesthetic appeal. From electricity-producing fuel cells, to operationally-dynamic window and wall systems, to heat pump water heaters, these projects have the potential to improve the efficiency of buildings, creating cleaner, more livable communities.

The Community Energy Program helps communities, towns, and cities save energy, create jobs, promote growth, and protect the environment through improved energy efficiency and sustainable building design and operation. Key ongoing programs include *Rebuild America* to help communities design and implement energy-saving programs; Information and Outreach to provide citizens and businesses with materials to help them improve the energy efficiency of their buildings; the public/private Partnership for Advancing Technology in Housing (PATH) to provide customized technical assistance to residential partners; and Training and Assistance for State Building Energy Codes to assist States in updating and implementing complex commercial building codes by developing simplified approaches to code use and enforcement.

The ENERGY STAR® program educates the public on the energy use of equipment, appliances, and buildings and helps them make economically and environmentally sound purchase decisions. The ENERGY STAR® program also promotes BTS' research results, such as the development of high-efficiency windows.

FY 2001 Highlights

Building Research and Standards – In collaboration with industry partners, BTS plans to develop technology road maps to direct cost-shared research, development, and deployment of efficient technologies for residential buildings, building envelope technologies, appliances, and building cooling, heating, and power. BTS' portfolio of research investments will be competitively selected according to the potential for projects to yield timely energy savings and environmental benefits. BTS expects to accelerate the pace of development for promising innovative technologies. In addition, Residential and Commercial Buildings R&D will be expanded through competitive procurement to address the priorities identified in their roadmaps. In FY 2001, new efforts in the areas of lighting, windows, heating and cooling, and refrigeration will focus on road map RD&D to advance innovative building envelope technologies. BTS will improve and expand the analysis to support the development of consensus standards for lighting and appliances. This will lead to the acceleration of lighting and appliance standards rulemaking activities for distribution transformers, clothes washers, and residential central air conditioners.

Building Technology Assistance – As part of Building Technology Assistance, BTS will weatherize more than 75,000 homes in FY 2001. We will provide support for States through the State Energy Program. In addition, States will have the opportunity to participate in the Special Projects State Grants to undertake efforts that will increase energy efficiency in the transportation, buildings, and industry sectors. BTS will expand its *Rebuild America* partnerships and fund competitively-selected community energy grants that are supported by a wide range of public and private entities, including States, business improvement districts, homebuilders, retailers, and nonprofit organizations. These projects, based on local priorities, will encourage innovation in building design and energy technology, lower the cost of housing, and help local economies to become more energy efficient. In addition, BTS will support the EnergySmart Schools initiative, a national public/private partnership to improve energy efficiency in schools and to reinvest the savings in education. BTS will provide customized technical assistance to residential partners through the Partnership for Advancing Technology in Housing and will continue to train building code officials. BTS will also expand the ENERGY STAR® program by increasing the number of ENERGY STAR® retail partners and labeling additional types of appliances.

Building, Technology, State and Community Programs Funding (in million of dollars)				
	FY 1999	FY 2000	FY 2001 Request	% Change (FY 00-01)
Building Research and Standards †	60.3	75.4	100.1	33%
Technology Road Maps and Competitive R&D	6.3	6.9	11.0	60%
Residential Buildings Integration	9.4	11.9	13.5	13%
Commercial Buildings Integration	2.5	4.2	6.5	52%
Equipment, Material, and Tools	42.1	52.3	69.2	32%
Building Technology Assistance †	187.3	189.5	225.0	19%
State Energy Program	33.0	33.5	37.0	10%
Weatherization Assistance Program	133.0	135.0	154.0	14%
Community Energy Program	18.6	18.2	27.5	51%
Energy Star Program	2.7	2.7	6.5	139%
Energy Efficiency Science Initiative	0.0	3.9*	0.0	
Cooperative Programs with States	0.0	2.0*	0.0	
Management and Planning	13.5	13.2	14.7	11%
Total †	261.1	284.0	339.8	20%

* Funding provided by Congress in FY 2000.

† Sums may not add due to rounding.

OFFICE OF POWER TECHNOLOGIES

Clean and Competitive Power Technologies for the 21st Century

According to the Energy Information Administration's Annual Energy Outlook 2000, a strong link between increased electric use and increases in the Nation's Gross Domestic Product (GDP) will continue. Electricity, which today accounts for 37 percent of the Nation's energy use, fuels the Nation's continued economic growth. While the GDP is projected to increase by 33 percent from 1998 to 2010, electric generation only increases by 15 percent. This continued reduction can largely be attributed to continued efficiency gains in the generation, delivery and end-use of electricity, a primary focus of EERE's programs. However, to meet the anticipated need for additional electric power, new sources of clean generation are desirable.

EERE's Office of Power Technologies (OPT) leads the Federal effort to develop renewable energy technologies and to accelerate their acceptance and use. To accomplish its mission, OPT supports research and development of renewable energy technologies that enable the efficient delivery of clean, reliable and affordable energy by working with industry to improve the cost and performance of renewable energy technologies, including photovoltaics, concentrating solar power, biopower, wind power, hydroelectric power, and geothermal energy. OPT also encourages electric system energy efficiency and reliability by managing research in advanced transmission and distribution technologies, high-temperature superconductivity, energy storage, and hydrogen production, storage and utilization

OPT pursues a carefully selected portfolio of technology development programs applicable to all energy-consuming sectors of the economy. OPT supports R&D on advanced technologies that integrate power from renewable energy resources into the Nation's electric grid and/or improve the efficiency and reliability of the electric sector. In order to facilitate the smooth integration of advanced renewable and energy efficient technologies into the emerging competitive electric supply market, OPT also provides technical assistance and information to States and others grappling with the complex issues surrounding electricity restructuring. This is vital to achieving significant near-term gains in renewable power generation capacity and to reap the early economic, health and environmental benefits of these clean power systems.

Ongoing Programs

Solar Buildings Technology – Imagine “zero energy, zero emission” buildings that economically provide all their own energy from solar energy, providing a comfortable environment in which to live or work and one safe from power outages. This is the goal of the Solar Building Technology Program, which explores ways to optimally combine solar energy technologies with energy efficient appliances and construction techniques.

Photovoltaics – OPT's Photovoltaic Energy Systems Program conducts fundamental and applied research on materials and device development, manufacturing processes, module reliability, and system testing and evaluation. Efforts are directed toward achieving critical gains in efficiency, manufacturability, and system longevity to assure photovoltaics' place in the competitive marketplace.

Concentrating Solar Power – The Concentrating Solar Power (CSP) Program is working with U.S. industry to develop high-reliability distributed CSP systems and reduce the cost of dispatchable systems from the current 10-12¢/kWh to 6-8¢/kWh within 5 years. CSP systems provide high-value renewable power since energy storage and hybrid designs allow energy to be provided on even when the sun is not

shining. Ranging in size from several kiloWatts (dishes) to multi-megaWatt installations (troughs, towers), CSP systems are expected to satisfy substantial domestic and international energy needs, contributing over 5,000 MW worldwide by 2010, and eliminating 1.3 million metric tonnes of carbon annually in the U.S. alone.

Biopower – OPT conducts a multifaceted Biomass Power Systems Program and supports the President’s Bioenergy Initiative. Biopower is a baseload renewable electricity option that can provide substantial environmental benefits to the Nation. The program is working toward integrated feedstock and power conversion systems that are competitive with conventional fossil-based options. OPT is developing advanced conversion systems to utilize biomass-derived fuels more cleanly and efficiently, resulting in a “home-grown” renewable energy supply industry that provides a vital economic stimulus to rural America and a more secure energy future.

Wind Energy Systems – Wind energy is experiencing rapid growth in the United States, with wind turbines around the Nation now producing enough electricity to power nearly 500,000 average U.S. households each year. Over 1000 MW of new wind generating capacity was added during 1998 and 1999, representing an industry investment of over \$1 billion and bringing total U.S. installed capacity to about 2500 MW. Improvements in performance, cost-effectiveness, and reliability have helped make wind energy technology the fastest growing source of energy in the world for over ten years.

Competitive Solicitation Program – The Competitive Solicitation Program is designed to conduct competitively-awarded, geographically-diverse renewable energy technology field validations, in both stand-alone and hybrid technology applications. Initial feasibility studies conducted in FY 2000 will lead to a number of project developments to provide essential operational and performance data on various clean, renewable technology applications.

Geothermal – The Geothermal Energy Program works in partnership with U.S. industry to establish geothermal energy as an economically competitive contributor to the Nation’s energy supply. To be achieved through a comprehensive research effort directed at developing improved techniques to find and produce geothermal resources, drilling costs will be reduced the efficiency of converting geothermal heat to useful products will increase.

Hydrogen – The Hydrogen programs works with industry and universities to develop mid- and long-term integrated hydrogen systems for power generation and transportation applications. The use of hydrogen as an energy source promises enormous environmental benefits as a near-zero emission fuel. Developing critical technologies to lower the cost of hydrogen production, storage and utilization is vital for introducing hydrogen into the energy infrastructure. OPT facilitates the introduction of these technologies in cost effective, integrated systems in high priority areas such as renewable/hydrogen electric generation systems, hydrogen for zero emission vehicles, and remote power systems. These crucial technologies reduce dependency on expensive oil products, promote rural electrification and economic development, and use grid-independent systems while reducing NO_x, SO_x, and CO_x emissions.

Hydropower – The Hydropower program focuses on developing advanced technology to allow the Nation to maximize use of its hydropower resources while minimizing adverse environmental effects. The program’s efforts will help preserve hydropower’s contribution to U.S. electric power production, which is about 10 percent of the Nation’s total today.

Advanced Electric Energy Systems and Storage – OPT is using an integrated approach to ensure the reliable delivery of electric services for consumer use in competitive, restructured electric markets. The

Transmission Reliability, Distributed Power and Energy Storage programs comprise the Electric Grid Reliability Initiative.

PEM Fuel Cell Field Validation

A 50 percent cost-shared cooperative agreement was signed with Air Products and Chemicals, Inc., and their partners, Plug Power, Inc., and the City of Las Vegas to construct, operate and maintain a hydrogen refueling station. This station will demonstrate how low-cost electricity can be produced from a 50kW PEM fuel cell while providing cost-effective hydrogen fuel for vehicles from a single facility. The goal is to demonstrate the ability to achieve electric power for 6 cents/kWh and less than \$1.20/gallon equivalent for the hydrogen from the refueling station when these systems are built in quantity.

FY 2001 Highlights

Solar Buildings Technology – In FY 2001, the program will support development of new polymer solar collectors to provide inexpensive energy for water and space heating; conduct research on a new technology that collects sunlight and distributes it into interior rooms of a building through fiber optics; and coordinate related energy efficiency, lighting, heating, and power supply R&D activities with the Office of Building Technology, State and Community Programs.

Photovoltaics – In FY 2001, OPT will increase fundamental research to support two new activities: basic R&D for breakthrough/non-conventional PV technologies aimed at dramatic cost reductions; and substantially increasing the efficiency of large area thin films and multi-junction concentrator cells. Both dramatically reduce dollar-per-Watt values for photovoltaics. In addition, OPT will continue to accelerate industry mass production by aggressively supporting manufacturing research and development. Under the Million Solar Roofs Initiative, efforts to expand deployment of solar systems throughout the U.S. through partnerships with utilities, builders, Federal and State agencies, cities, and financial institutions will continue.

Concentrating Solar Power – In FY 2001, program efforts pursue three research “paths.” *Distributed Power Systems* emphasizes field testing of 25kW utility-scale dish/engine systems, validating automated off-grid operation of a 10kW remote solar power system on Native American lands, and working with partners to investigate smaller (1-5kW), solid-state dish-based systems (e.g., high-concentration PV) suitable for residential applications. *Dispatchable Power Systems* works with industry to develop advanced solar trough components to position U.S. firms to compete for near term World Bank-sponsored projects. *Advanced Components and Systems Research* addresses higher-risk R&D efforts—such as research into hybrid solar/gas (natural gas and hydrogen) systems and high-temperature components—that will allow broader penetration of domestic and international markets and achieve costs under 6¢/kWh by 2010.

Biopower – In FY 2001, OPT will continue investigating advanced thermochemical conversion, large and small systems development, and biomass for cogeneration. OPT’s initiative to co-fire biomass with coal will support technology development leading to near-term reductions in carbon emissions.

Wind Energy Systems – In FY 2001, OPT will lead the Wind Powering America Initiative to dramatically accelerate the use of wind energy in the United States, focusing on providing economic development opportunity in rural areas while meeting a growing demand for clean energy. Wind energy research and

development activities will continue as the priority for the Wind Program, to mature the technology and address remaining cost barriers. For example, the first full scale prototypes under the Next Generation Turbine project will begin field testing in FY 2001, a key step toward a commercial technology capable of achieving the program's 2½ cents/kWh cost of energy goal. New cutting-edge components and advanced turbine concepts will be under development with industry partners to provide a suite of technologies to further improve performance. Competitive solicitations will be issued to help industry gain valuable field verification experience with emerging wind turbine and wind hybrid system technologies under a variety of regional settings. These projects will also provide the Wind Program with a better understanding of the complex siting, regulatory, electric grid system integration, and market issues.

Competitive Solicitation Program – In FY 2001, OPT will begin the development phase of its six-year Competitive Solicitation Program for renewable energy technologies aimed at accelerating the development and use of the most promising technologies as determined by the marketplace. This effort will leverage as much as \$30 million annually in new renewable energy projects through competitively-awarded, geographically diverse renewable and renewable/hybrid technology field validations in remote and economically challenged regions of the Nation, including Native American lands.

Geothermal – In FY 2001, the Program will accelerated the pace of geothermal development in the western U.S. through a new initiative, GeoPowering the West.

GeoPowering the West

The initiative will assess the many and varied geothermal resources lying close to the surface in a number of states. Potential applications of these largely underused resources range from electric power generation to heating individual homes. Recent studies identified nearly 300 communities in 10 western states with potentially usable resources within five miles. GeoPowering the West is based on a partnership of public and private interests under DOE leadership. OPT has developed a draft action plan to implement the Initiative, calling for geothermal to provide the energy needs of seven million western U.S. homes by 2010 and 10 percent of the electricity needs of nineteen western states by 2020.

Hydrogen – In FY 2001, the Hydrogen program will install and operate two advanced units to validate several hydrogen production processes and will continue development and field validation of proton exchange membrane (PEM) fuel cells systems, including: diesel reformato fueled electric generation for use in an arctic environment; a wind/reversible hydrogen generation and storage fuel cell system; and a system for fueling hydrogen vehicles.

Hydropower – In FY 2001, the program will conduct biological studies and test environmentally friendly systems with the ultimate goal of reducing turbine-induced fish mortality to 2 percent or less.

Advanced Electric Energy Systems and Storage – In FY 2001, the *Transmission Reliability* program will apply advanced computing, communications and power electronics technologies in developing real-time power information and control systems to ensure a reliable delivery infrastructure that can accommodate a portfolio of central and distributed generation systems. The *Distributed Power* program will address barriers to integrating distributed power systems into the electric delivery infrastructure, such as accelerating the development of an interconnection standard. The *Energy Storage* program will start operational testing of an advanced battery energy storage system in an urban substation to improve reliability, monitor regional transmission power quality in collaboration with a consortium of southern utilities, and initiate two projects that combine energy storage with renewable energy generation and/or

diesel generation systems. In addition, the *High Temperature Superconductivity* program will continue its world-recognized advance in the development of higher performance superconductors and their application in power equipment, such as testing a prototype 5,000 horsepower industrial motor. Superconducting power equipment can significantly reduce electric losses in the generation, delivery, and use of electricity and provide transmission cables to overcome delivery system constraints, particularly in urban areas.

Power Technologies Program Funding* (in million of dollars)				
	FY 1999	FY 2000	FY 2001 Request	% Change (FY 00-01)
Solar Building Technology Research	3.6	2.0	4.5	129%
Photovoltaic Energy Systems	70.6	65.9	82.0	24%
Concentrating Solar Power	16.8	15.2	15.0	-1%
Biomass Power	30.8	31.8	48.0	51%
Wind Energy Systems	34.1	32.5	50.5	55%
Renewable Energy Production Incentive	4.0	1.5	4.0	167%
Solar Program Support †	0	4.9	6.5	32%
International Solar Energy Program	6.3	3.8	11.5	201%
Geothermal	28.2	23.6	27.0	14%
Hydrogen Research	22.0	24.6	23.0	-6%
Hydropower	3.2	4.9	5.0	2%
Renewable Indian Energy Resources	4.8	3.9	5.0	29%
Electric Energy Systems and Storage	40.9	37.8	48.0	27%
Federal Building/Remote Power Program†	4.0	0.0	0.0	
International Market Development	2.6	2.6	4.6	77%
Total ‡	271.7	255.0	334.6	31%

* Does not include Solar Program Direction, National Renewable Energy Laboratory maintenance, and Departmental Energy Management Program.

† Solar Program Support includes both the Electric Restructuring and the Competitive Solicitation Programs. Activities previously conducted under the Federal Buildings/Remote Power program have been folded into a single, integrated effort with the Competitive Solicitation Program.

‡ Sums may not add due to rounding.

FEDERAL ENERGY MANAGEMENT PROGRAM

Lowering Energy Costs at Federal Facilities for the 21st Century

As the nation's largest single energy user, the Federal Government spends roughly \$8 billion each year on energy in its facilities and operations. The Federal Energy Management Program (FEMP) achieves significant cost savings and associated environmental benefits by assisting Federal Agencies in identifying, financing, and implementing energy efficiency and renewable projects in Federal facilities and operations. FEMP's goal is to improve efficiency in Federal buildings by 35 percent by 2010 compared to 1985 levels of energy use. Since 1985, the Federal Government has achieved a 18.7 percent improvement, reducing annual costs in buildings by \$2.2 billion in 1998.

FEMP will continue to sustain a core level of Federal energy management while working to expand the expertise at all Federal Agencies and opening access to private sector capital available to fund energy efficiency and renewable energy projects.

Ongoing Programs

FEMP has established regional Super Energy Savings Performance Contracts (ESPCs) in EERE's six regions along with three nationally-accessible, technology-specific Super ESPCs. ESPCs use private capital to provide energy efficiency services to Federal facilities and allow Federal Agencies to pay for these services through energy cost savings.

Green Energy Parks Initiative

"Green Energy Parks" is a joint program of the U.S. Department of Energy and the Department of Interior's National Park Service (NPS) to preserve and protect the environmental quality of America's national parks through the deployment of clean energy technologies. The role of clean energy in protecting and preserving our national parks becomes more apparent as our parks struggle with diminished financial resources and increased visitorship.

The use of energy efficiency and renewable energy technologies and other smart energy management strategies in the national parks reduces air and noise pollution and greenhouse gas emissions, saves taxpayers dollars, and provides an enhanced visitor experience. The Green Energy Parks Initiative also provides a high visibility opportunity to educate the over 280 million annual park visitors on the benefits of clean energy technologies and expand the market for DOE programs and technologies.

The Green Energy Parks Program will be implemented at the park level and supported by regional teams of DOE and NPS staff who will match parks with public and private sector organizations that can provide financial and technical assistance. DOE has committed \$1.8 million in FY 2000 to fund and provide technical assistance to Green Energy Parks projects.

In addition, FEMP provides technical assistance through SAVEnergy audits, evaluates project proposals, provides up-front engineering and design support, and assists in measuring and verifying energy savings from these projects. FEMP also develops analytical tools and information to assist Federal Agencies in identifying and selecting cost-effective energy projects and products.

In FY 1999, FEMP provided training and outreach for over 4,700 Federal energy managers and continues to provide up-to-date information on technical tools, techniques, and financial mechanisms to encourage energy efficiency and use of renewable energy sources. FEMP assistance also provides opportunities for Federal Agencies to share success stories and lessons learned. A recent survey documented that FEMP training workshops have helped 98% of attendees implement energy efficiency projects, including those who either were unaware of, or still seeking, information about energy efficient technologies prior to attending the workshop. This survey demonstrates a high correlation between attending FEMP workshops and Federal energy projects. FEMP also coordinates Government-wide energy policy through the Interagency Energy Management Task Force and the Interagency Energy Policy Committee, identifying and resolving barriers to financing and implementing energy efficiency and renewable energy projects.

FY 2001 Highlights

The increase in FEMP's FY 2001 budget promotes the application of energy efficiency improvements in buildings and operations to increase efficiency and reduce government energy consumption by 35% by 2010, as set forth in Executive Order 13123. To accomplish these goals, FEMP will provide leadership and coordination on cross-cutting issues, provide technical assistance and training in a wide variety of areas, and work with other agencies to facilitate their own energy efficiency and renewable technology activities. FEMP also will continue to emphasize the availability of alternative financing such as ESPCs and utility agreements for projects.

To support its alternative financing efforts, the Department is educating agencies on choosing the most appropriate financing option for their site. The Department is putting out guidance on ESPC authority to be as flexible as possible in implementing ESPC's at Federal agencies. In FY 2001, FEMP will identify cost-effective opportunities for combined heat and power technology, and biomass co-firing in boilers at Federal sites. FEMP will expand the procurement of energy efficient equipment and will streamline energy efficient and renewable energy purchases. FEMP will continue to support the Million Solar Roofs Initiative by helping the Federal Government reach its goal of installing 2,000 solar energy systems by the end of FY 2000 and 20,000 solar energy systems on Federal facilities by the end of 2010. In addition, FEMP will support the Interagency Energy Management Task Force's new efforts to develop effective approaches to procure bulk electricity, including "green power," in the emerging competitive utility environment. Funds also will support the implementation of Executive order 13123 requirements at Department of Energy facilities.

Federal Energy Management Program Funding (in million of dollars)				
	FY 1999	FY 2000	FY 2001 Request	% Change (FY 00-01)
Project Financing	9.8	9.9	10.4	5%
Technical Guidance and Assistance	7.5	7.5	10.2	36%
Planning, Reporting and Evaluation	4.4	4.4	5.4	23%
Departmental Energy Management	0.0	0.0	5.0	100%
Program Direction	2.1	2.2	3.5	59%
Total *	23.8	24	34.5	44%

* Sums may not add due to rounding.

CORPORATE CROSSCUTTING PROGRAMS

Crosscutting Initiatives in Buildings, Industry, Transportation and Power for the 21st Century

EERE's crosscutting programs and initiatives advance technologies through work in more than one sector of the energy economy. While the EERE organization is structured around programs in the buildings, industrial, transportation and power sectors, our research yields technologies that can be applied across these sectors and EERE program offices. The emergence of crosscutting technologies calls for programs that cut across the EERE organizational structure. Combined heat and power, for example, promises to provide significant savings both for commercial buildings and industry. Fuel cells under development will increase the efficiency of energy use in both buildings and cars. EERE sector offices are combining their efforts to support initiatives that advance these and other technologies. The following crosscutting programs and initiatives link EERE sectors:

The President's Bioenergy Initiative

The Bioenergy Initiative is a government-wide, integrated research, development and deployment effort to advance bio-based technologies that convert crops, trees, and other "biomass" into a vast array of power, fuels and products. Biobased industries use agricultural, forest, and aquatic resources to make commercial products including fuels, electricity, chemicals, adhesives, lubricants, and building materials. The initiative supports the President's August 1999 Executive Order 13134 and Memorandum on Promoting Biobased Products and Bioenergy; a primary goal is tripling the use of biobased products and bioenergy in the United States by 2010. The initiative seeks to make biomass a viable competitor to fossil fuels as an energy source and chemical feedstock, while protecting the environment.

The initiative provides an increase of more than \$240 million over the amounts available for FY 2000, with \$49 million of this increase for programs managed by the Department of Energy (DOE) and \$194 million for enhanced efforts at the Department of Agriculture (USDA).

Reaching the President's goal would generate billions of dollars in new income for farmers and foresters and increase product diversity. It would strengthen the rural economy and ensure sustainable rural communities by producing 50,000 new, high technology jobs in small processing plants in rural America, and adding up to 130,000 such jobs in the biopower, bioproducts, and biofuels industries. It would also generate the equivalent of 348 million barrels of oil a year by 2010, and would lower the emissions of greenhouse gases by 100 million tons, equal to the amount emitted today by 70 million cars.

Million Solar Roofs

Million Solar Roofs (MSR) is an initiative to install solar energy systems on one million U.S. buildings by 2010. Announced by President Clinton in a speech before the United Nations Session on Environment and Development in 1997, the Initiative includes two types of solar energy technology: photovoltaics that produce electricity from sunlight and solar thermal panels that produce heat for domestic hot water, space heating, or heating swimming pools.

MSR has partnered with the building sector, utilities, other federal agencies, state and local governments, the solar energy industry, financial institutions, and non-governmental organizations to remove market barriers to solar energy use and to develop and strengthen local demand for solar energy products and applications. Within EERE, the Initiative works with programs including the Photovoltaics and Solar

Buildings programs in the Office of Power Technologies, Rebuild America, EnergySmart Schools, the Federal Energy Management Program, and ENERGY STAR® program to identify opportunities for collaboration and strategic use of resources.

A key strategy of the Million Solar Roofs Initiative is to catalyze market demand in local areas by establishing State and Local Partnerships. In FY 2001, MSR will continue to focus support in the 40 State and Local Partnerships with access to small grants; training and technical assistance; financing mechanisms; recognition and support; and a link to other businesses, associations and program areas that can provide assistance. In addition, MSR will continue work to remove national barriers to building-related solar energy use, including interconnection to the utility grid, financing, solar access through codes and covenants, linkages to national builders and developers, and increasing peer to peer exchange among MSR Partnerships.

Combined Heat and Power

Recent advances in combined heat and power technology have resulted in the development of improved systems that are highly efficient, environmentally friendly and profitable. These advances, combined with increasingly innovative uses of existing technologies, have created a new window of opportunity for Combined Heat and Power (CHP). This opportunity is enabled by very high overall efficiency and by placing these advanced generation technologies at the point of use to meet both the electrical and thermal energy needs of local, residential, commercial and manufacturing complexes. CHP includes familiar technologies such as combustion turbines, reciprocating engines and district energy systems -- and newer technologies such as microturbines, advanced turbines, fuel cells and photovoltaics. Heat recovery systems can be combined with heat-powered chilling to produce cooling as well as heating. The competitive advantage of CHP systems is in utilizing energy that would otherwise be lost as "waste" in conventional processes. CHP systems maximize fuel conversion efficiency.

The goal of DOE's new CHP Challenge is to double the amount of CHP in the U.S. by the year 2010 (adding approximately 46 gigawatts of additional capacity). Reaching this goal means tackling a wide range of technical, institutional and regulatory barriers that currently impede expanded use of CHP. For example, under existing air quality laws and regulations, potential CHP users do not receive emissions credit for reductions that occur with on-site power generation. In addition, they face difficulties interconnecting CHP facilities with the utility grid. The CHP Challenge addresses these and other barriers and assesses potential CHP opportunities

The CHP Challenge Program involves numerous partners. These include EERE's Offices of Building Technologies, Power Technologies, FEMP and the regional offices along with state energy offices, the U.S. Environmental Protection Agency as well as national associations. The partners are working to overcome the barriers and technological hurdles that have limited the nation's ability to realize the many potential benefits of combined heat and power.

Electric Grid Reliability and Distributed Power

The Electric Energy Systems and Storage programs have an integrated objective of ensuring the reliable delivery of electric services to consumers in competitive, restructured electric markets. Three of the programs -- Transmission Reliability, Energy Storage and Distributed Power -- address transmission and distribution system needs and the interconnection and integration of distributed generation resources to meet this objective. By distributing smaller-scale power generation either on-site or in close proximity to its use, the stresses on the transmission systems of increased consumer use of electricity can be relieved. Technology

needs for the transmission and distribution system include the development of advanced, real-time monitoring and control systems. Technologies that can provide distributed generation include wind,

High Temperature Superconductivity Breakthroughs Continue

The 20th century was notable for electric wires connecting everything and everyone. This century will see these wires replaced with something far better -- superconducting wires that carry huge amounts of current without resistance losses. In 1995, DOE's Los Alamos National Laboratory showed that over a million amps of current could be carried through only a square centimeter of high temperature superconductor (HTS) material -- over 10,000 times the amount carried by conventional electric wire materials (copper or aluminum) free from energy losses caused by electrical resistance. The following year, Oak Ridge announced another way to accomplish this without the lasers and vacuum systems used in the Los Alamos method. Since then, five industry teams have purchased licenses for the technology and are aggressively finding ways to adapt these discoveries to industrial practice. Recently, 3M and MicroCoating technologies (a Georgia high tech company) won awards in a competition to take the next step -- continuous manufacturing of this revolutionary type of wire. A new program goal is to carry 1000 amps of current through a 10 micron coating of superconductor (about as thick as 3 human hairs) on a centimeter wide metal strip. Designs of transmission lines and other types of electrical equipment will be developed in 2001 based on this emerging capability -- becoming much more compact, efficient, and cost-effective.

photovoltaics, concentrating solar power, fuel cells, gas turbines, hydrogen production and storage, and hybrid renewable/fossil power systems. In addition to their system reliability benefits, advances in these distributed generation technologies can significantly reduce energy use and carbon emissions and enhance the competitiveness of electric markets. To attain the benefits of distributed power, EERE is developing advanced distributed generation technologies; addressing barriers to their use through actions such as the development of an interconnection standard; and addressing the associated electric distribution system monitoring and control needs.

International Programs

EERE's international programs encourage greater use of U.S. energy efficiency and renewable energy technologies by developed, developing and transition countries to help meet energy needs worldwide, reduce the rate of consumption of finite fossil energy resources, and address local and global environmental issues. Working cooperatively with the private sector, other Federal agencies, and others, EERE identifies and implements priority activities to advance technology development and deployment in the fastest growing and often most difficult-to-penetrate energy markets. Technologies that face significant domestic commercial barriers may be readily adaptable to large and growing markets in the developing world. Greater exports will help U.S. energy efficiency and renewable energy industries compete domestically through cost-saving economies of scale.

International activities will be prioritized and selected by considering: U.S. strategic interests and policies; the DOE mission; leveraged funding; national, regional or global impacts; potential for replication; commitment from other-country partners; likely impact on U.S. market position; and other relevant factors. Activities will focus on three areas: 1) emerging global environmental and energy issues; 2) market and trade development; 3) and energy and environmental security. Emerging global environmental issues, such as climate change, will be addressed through the U.S. Initiative on Joint Implementation (USIJI). USIJI

supports the development of flexible mechanisms that promote clean energy deployment under the United Nations Framework Convention on Climate Change. Market and Trade Development activities will be implemented in key regions through bilateral and multilateral technology cooperation activities.

The program is being expanded through the International Clean Energy Initiative which focuses on increasing energy efficiency in the Building and Industry sectors, and promoting a cleaner energy supply with emphasis on biomass, wind, solar and geothermal energy sources. The initiative assesses the potential for energy efficiency and renewable energy in targeted countries, stimulates feasibility studies and pilot projects of promising technologies, and attracts U.S. public and private financing sources to develop bankable projects. The initiative will create long-term relationships between U.S. public and private laboratories and organizations and those in developing and transition countries. The initiative will help the U.S. compete with some European countries and Japan in their support for the clean energy technology industries that expand their share of an exploding international market. The initiative is based on the report, "Powerful Partnerships; the Federal role in International Cooperation on Energy Innovation," issued in June 1999 by the President's Committee of Advisors on Science and Technology. While the private sector plays the major role in energy innovation, private sector investments alone will not capture the full range of public benefits. United States Government efforts can achieve significant benefits to the to fill the gaps.

EnergySmart Schools

EnergySmart Schools, a campaign of the *Rebuild America* program, is a partnership that brings together public and private sector resources to reduce energy bills in our nation's schools and redirect the savings to our children and their education. Energy costs for the nation's schools amount to more than \$6 billion annually. Most of our schools operate inefficiently, wasting resources that should be dedicated to education itself. By using EERE technologies, schools across the United States could potentially save up to \$1.5 billion in energy costs and 10 million metric tons of carbon emissions by 2010. EnergySmart Schools will integrate resources from the *Rebuild America* and Clean Cities programs, the President's Million Solar Roofs Initiative, the State Energy Program, and ENERGY STAR® program to improve energy efficiency in K-12 schools.

EnergySmart Schools will provide technical assistance, technology demonstrations, guidance in financing mechanisms, and/or education in energy awareness in at least 20 school districts in this Fiscal Year. High performance school design guidelines, in particular, are being produced in response to EERE school customers being faced with rising student enrollments. In addition to reducing energy use, EnergySmart Schools will help to increase the use of clean energy technologies in existing schools and new school design. These measures will help to improve the learning environment of classrooms through daylighting, better temperature control, and improved air quality. Finally, the initiative will increase student, teacher, and community awareness of energy and related issues, including financial management, air quality, climate change, and new energy technologies.

REGIONAL OFFICES AND THE GOLDEN FIELD OFFICE

Implementing EERE Programs in the Field

The primary role of EERE's Regional Offices (RO) and the Golden Field Office (GO) is to provide procurement, legal, and technical support for many of EERE's financial assistance programs and to facilitate deployment of EERE's technology programs to Federal, regional, State and local customers. Along with State Energy and Weatherization offices and EERE's sector programs, the ROs and GO are critical to implementing EERE programs in the field.

Regional Offices

The principal function of EERE's six Regional Offices is to help deliver the wide variety of Congressionally authorized grant and technology deployment programs for EERE. The ROs offer the appropriate mix of these programs to serve the needs of regional and local stakeholders. Among these stakeholders are governors, State Energy Offices and elected local officials.

In addition, ROs serve as national project managers for special activities under EERE's core programs, including Weatherization Assistance Program, Federal Energy Management Program, State Energy Program, Clean Cities, Codes and Standards, Rebuild America, and State Industries of the Future. The ROs also help States address unique regional opportunities using EERE programs. For example, the ROs are assisting States in identifying how EERE programs and technologies can help them meet Federal Clean Air Act requirements within the provisions of State Implementation Plans.

Regional Offices serve as a key communications link between EERE's sectors and State Energy Offices, other major regional, State and local stakeholders. The ROs also provide feedback on needed improvements to EERE's programs and keep Headquarters informed of regional energy challenges.

Golden Field Office

The primary role of the Golden Field Office (GO) is to provide procurement, legal business management, and technical support to EERE, thereby enhancing EERE's capability to develop and facilitate the deployment of clean energy and energy efficiency technologies.

Working with private sector organizations in almost every State and Mexico, Golden provides field project management support for clean energy and energy efficiency projects. These projects are funded through cooperative agreements and grants and have a total value of nearly \$1 billion, including the cost share from private sector partners. For example, GO provides procurement, legal and technical support for several large, cost-shared biomass-to-power and biomass-to-ethanol projects.

Golden also administers the performance-based management contract for the National Renewable Energy Laboratory (NREL). NREL is the nation's only national laboratory solely dedicated to research and development of renewable energy and energy efficiency technologies.

Contact Numbers for Office of Energy Efficient and Renewable Energy

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Office of Transportation Technologies	(202) 586-8027
Office of Building Technology, State and Community Programs	(202) 586-1510
Office of Power Technologies	(202) 586-9275
Federal Energy Management Program	(202) 586-5772
Customer Service Program	1-800-DOE-EREC (363-3732)
WEBSITE:	http://www.eren.doe.gov